The flora of Maltese walls

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Abstract: The wall flora of Malta contains some 140 species. The participation of plant families and life forms is discussed with regard to the types of walls. The Parietario-Antirrhinetum siculi is documented by plant sociological relevés. *Oxalis pes-caprae* is the most important alien species in the wall vegetation.

1. Introduction

The Republic of Malta consisting of the three main islands Malta, Gozo and Comino, and some small rocky islets is situated in the central mediterranean sea about 90 km south of Sicily and 350 km north of Tripoli. These islands are probably the remaining part of the landbridge which existed during the tertiary or part of the pleistocen between Europe and Africa (HASLAM, SELL & WOLSELEY 1977). The islands consist of flat tertiary sedimentary rocks. The whole area of the land side is 316 km², 246 km² belong to the main island Malta. The maximum rise of Malta is 251 m.

The climate is typically mediterranean: very hot dry summers and mild winters, where the average temperature of January does not go below + 10°C. The yearly precipitation is said to be about 500 mm, shows however large deviations.

The vascular plant flora of the island groups is with some 900 species astonishingly poor. The reasons could be the very low differences in altitude and sea-level changes in the past. The main reason however is likely to be the high density of population (about 1220 inhabitants per km²). Woods or permanent rivers are laking totally, macchia-like stands are only to be found in small valleys. The part of anthropogenic vegetation as well as of scarce vegetation of the rocky plateaus is relatively high. According to HASLAM, SELL & WOLSELEY (1977) the part of weeds of the flora of Malta is 24 %, the part of ruderals is 16 %. The part of the synanthropic flora in whole is therefore much more higher compared to cities in Germany for example.

Due to these specialities and to the high number of walls the wallflora and vegetation of the main island Malta was studied in 1990 and 1995.

2. The wall flora of Malta

Some 144 wall-dwelling species are known for Malta, with further investigations it is possible that the number increases. 144 species means 16 % of the entire flora of Malta, the relation is similar to Central European cities. Amongst these 144 vascular plants growing on walls only 4 ferns are to be found, which seem to be rare. Gymnospermae are missed totaly. The family Asteraceae is the most frequent one (24 species), followed by the Poaceae (15 species), Scrophulariaceae (9 species) and Brassicaceae (7 species).

Compared to the atlantic parts of Europe and to the northern part of the Mediterranean region the relatively high amounts of chamaephytes (13,9 %), therophytes (43,1 %), woody plants [phanerophytes + nanophanerophytes + woody chamaephytes] (12,5 %), and geophytes are evident. In contrary the part of hemicryptophytes (22, 9 %) is relatively low. The high amount of chamaephytes is characteristic for the whole mediterranean region, whereas a higher amount of woody plants and geophytes is found in the eastern Mediterranean region (Brandes 1992 b).

The following species have been recorded for walls of Malta according to our own findings and completing accounts of HASLAM, SELL & WOLSELEY (1977), the taxonomy follows PIGNATTI (1982):

2.1. PTERIDOPHYTA

Adiantaceae
Adiantum capillus-veneris

Aspleniaceae
Phyllitis sagittata, Phyllitis scolopendrium

Gymnogrammaceae
Anogramma leptophylla

2.2. SPERMATOPHYTA

2.2.1. MAGNOLITAE (= DICOTYLEDONES)

Aizoaceae
Mesembryanthemum nodiflorum

Apiaceae
Crithmum maritimum, Daucus carota, Ferula communis (fig. 1), *Foeniculum vulgare, Smyrnium olusatrum*

Araliaceae
Hedera helix

Asteraceae
Aster squamatus, Calendula arvensis, Calendula suffruticosa, Carlina corymbosa, Chiliadenus bocconei (= Jasonia glutinosa), Chrysanthemum coronarium (fig. 2), *Conyza bonariensis, Eupatorium cannabinum, Galactites tomentosa, Hedypnois cretica, Hyoseris radiata, Inula crithmoides, Inula viscosa (= Dittrichia viscosa), Pallenis spinosa, Phagnalon graecum, Phagnalon rupestre, Reichardia picroides, Scolymus cf. hispanicus, Senecio bicolor* (fig. 3), *Senecio leucanthemifolius, Senecio vulgaris, Sonchus oleraceus, Sonchus tenerrimus, Urospermum picroides*

Boraginaceae
Borago officinalis, Cerinthe major, Echium parviflorum

Brassicaceae
Diplotaxis tenuifolia, Erophila verna, Erysimum cheiri (= Cheiranthus cheiri), Lobularia maritima, Malcolmia africana, Matthiola incana (fig. 4), *Sisymbrium irio*

Cactaceae
Opuntia ficus-indica

Campanulaceae
Campanula erinus, Trachelium coeruleum

Capparidaceae
Capparis spinosa

Caryophyllaceae
Polycarpon tetraphyllum, Silene colorata, Silene vulgaris, Spergularia rubra

Chenopodiaceae
Atriplex halimus, Atriplex prostrata, Beta vulgaris ssp. maritima, Chenopodium album, Suaeda fruticosa

Convolvulaceae
Calystegia sepium, Convolvulus althaeoides (fig. 5), *Convolvulus arvensis*

Crassulaceae
Aeonium arboreum, Sedum rubens, Sedum sediforme, Umbilicus horizontalis, Umbilicus rupestris

Euphorbiaceae
Euphorbia peplus, Euphorbia cf. pinea, Mercurialis annua

Fabaceae
Lotus cytisoides, Medicago hispida (= Medicago polymorpha), Psoralea bituminosa

Geraniaceae
Erodium cicutarium, Erodium malacoides, Geranium dissectum, Geranium purpureum

Hypericaceae
Hypericum triquetrifolium

Lamiaceae
Lamium amplexicaule, Prasium majus, Salvia verbenaca, Teucrium fruticans

Lauraceae
Laurus nobilis

Malvaceae
Lavatera arborea (fig. 6), *Lavatera cretica, Malva parviflora, Malva sylvestris* (fig. 2)

Moraceae
Ficus carica

Myrtaceae
Eucalyptus spec.

Oleaceae
Olea europaea

Orobanchaceae
Orobanche spec.

Oxalidaceae
Oxalis corniculata, Oxalis pes-caprae (fig. 7)

Papaveraceae
Chelidonium majus, Fumaria capreolata, Papaver dubium

Plantaginaceae
Plantago albicans, Plantago psyllium

Polygonaceae
Rumex conglomeratus

Rosaceae
Rubus ulmifolius

Resedaceae
Reseda alba (fig. 8)

Rubiaceae
Galium aparine, Galium verrucosum, Rubia peregrina, Sherardia arvensis, Valantia muralis

Scrophulariaceae
Antirrhinum majus (fig. 9), *Antirrhinum siculum* (fig. 3, fig. 10), *Cymbalaria muralis, Kickxia commutata, Linaria pseudolaxiflora, Scrophularia peregrina, Veronica arvensis, Veronica cymbalaria, Veronica hederifolia*

Simaroubaceae
Ailanthus altissima

Solanaceae
Hyoscyamus albus, Lycium europaeum, Nicotiana glauca

Theligonaceae
Thelygonum cynocrambe

Urticaceae
Parietaria judaica, Urtica membranacea

Valerianaceae
Centranthus ruber

2.2.2. LILIATAE (= MONOCOTYLEDONES)

Araceae
Arisarum vulgare, Arum italicum

Liliaceae s. l.
Asparagus aphyllus, Asphodelus microcarpus (= Asphodelus aestivus), Smilax aspera, Urginea maritima

Poaceae
Arundo donax, Avena barbata, Avena sterilis, Brachypodium distachyum (= Trachynia distachya), Brachypodium ramosum (= Brachypodium retusum), Bromus diandrus, Bromus madritensis, Bromus rigidus,Catapodium rigidum (= Scleropoa rigida), Cymbopogon hirtus (= Hyparrhenia hirta), Cynodon dactylon, Hordeum leporinum, Lagurus ovatus, Oryzopsis miliacea, Stipa capensis

3. The flora of different types of walls

3.1. The flora of fortifications

The walls of most interest are without doubt the ancient bastion walls of Valetta (fig. 11) and Mdina (BRANDES 1992: tab. 8). An inclination of 75-85° is favourable for the colonization by plants. The huge city-walls of the former capital Mdina, situated in the middle of the island, are characterized by the following species:

Aeonium arboreum
Antirrhinum siculum
Avena barbata
Capparis spinosa
Calendula suffruticosa
Dittrichia viscosa
Ferula communis
Ficus carica
Hedera helix
Hyoseris radiata
Lavatera arborea
Lobularia maritima
Matthiola incana
Nicotiana glauca
Opuntia ficus-indica
Oxalis pes-caprae
Parietaria judaica
Prasium majus
Reseda alba
Valantia muralis

From the synsystematic point of view these vegetation types (see tab. 1) are to be set between Parietario-Antirrhinetum siculi Oberd. 1975, Capparidetum inermis O. Bolos & R. Molinier 1958 and an undescribed *Matthiola incana-Inula crithmoides*-communitiy, which is characteristic for old fortifications near the sea. In this paper

they are put to the Parietario-Antirrhinetum siculi, which is widespread in Malta at walls and even in quarries. *Capparis spinosa* is in this association only to be found in ancient bastion walls, especially near the sea.

Tab. 1: Vegetation of fortifications in Valetta and Mdina

Number of relevé	1	2	3	4	5	6	7
Exposition	NE	NE	SE	N	S	N	N
Inclination (°)	25	25	10	90	90	85	85
Area (m²)	20	30	5	10	30	20	20
Cover (%)	5	15	15	40	20	30	25
Species number	4	9	7	6	4	9	9
Inula crithmoides	1.1	1.1	1.1	.	.	.	.
Matthiola incana	1.1	2.1	1.1	1.1	.	.	.
Senecio bicolor	.	+	.	.	.	.	.
Antirrhinum siculum	.	+	2.1	3.2	1.1	2.1	1.1
Sonchus tenerrimus	.	+	1.1	.	.	2.1	2.1
Capparis spinosa	.	.	.	3.1	2.1	2.1	2.1
Parietaria judaica	.	.	.	2.2	.	2.2	1.2
Reichardia picroides	.	2.1	.	.	.	.	.
Ficus carica	.	.	.	.	.	1.1	.
Hordeum leporinum	.	1.2	2.2	.	.	.	+
Oxalis pes-caprae	+	.	.	.	.	.	+.2
Bromus madritensis	.	+°	.	+	.	.	.
Lobularia maritima	.	+.2	.	.	.	+.2	.
Carlina corymbosa	.	.	.	.	.	+	1.1
Hyoscyamus albus	1.1	.	.	.	.	.	.
Avena barbata	.	.	+	.	.	.	.
Beta vulgaris	.	.	+	.	.	.	.
Urospermum picroides	.	.	.	r	.	.	.
Nicotiana glauca	.	.	.	.	2.1	.	.
Sedum cf. rubens	.	.	.	.	2.2	.	.
Mercurialius annua	.	.	.	.	.	1.2	.
Galactites tomentosa	.	.	.	.	.	+	.
Prasium majus	.	.	.	.	.	.	1.2
Borago officinalis	.	.	.	.	.	.	+

After the attack of the Turkish navy in 1565 the new capital Valetta was fortified very well by the Knights of the Order of St. John of Jerusalem (now known as the Sovereign Military Order of Malta). At the huge bastions the following species indicate the immidiate vicinity of the sea:

Atriplex halimus
Beta vulgaris
Inula crithmoides
Senecio bicolor
Suaeda vera

On the inclined tops of the bastion walls grow among others:

Antirrhinum siculum
Avena barbata
Avena sterilis
Beta vulgaris
Bromus madritensis
Campanula erinus
Capparis spinosa
Carlina cf. crymbosa
Convolvulus althaeoides
Daucus carota
Dittrichia viscosa
Echium parviflorum
Erodium malacoides
Foeniculum vulgare
Galactites tomentosa
Hedypnois cretica
Hordeum leporinum
Hyoscyamus albus
Hyoseris radiata
Inula crithmoides
Lagurus ovatus
Lavatera arborea
Lavatera cretica
Lotus cytisoides
Malva parviflora
Malva sylvestris
Matthiola incana
Mercurialis annua
Mesembryanthemum nodiflorum
Nicotiana glauca
Orobanche div. spec.
Parietaria judaica
Phagnalon rupestre
Plantago afra
Polycarpon tetraphyllum
Psoralea bituminosa
Reichardia picroides
Reseda alba
Salvia verbenaca
Senecio vulgaris
Silene colrata
Sisymbrium irio
Sonchus oleraceus
Sonchus tenerrimus
Stipa capensis
Trachynia distachya
Urospermum picroides
Valantia muralis

The Urtico-Smyrnietum olusatri A. & O. Bolos ex Bolos & Molinier is growing at the wall basis in the shadow of trees. It is replaced by stands of *Lavatera arborea* and *Smyrnium olusatrum* at non shaded places (BRANDES 1991).

3.2. Flora of ruins in cities

As a reminder to the World War II the opera was not reconstructed; the ruins are used as parking place. The opera therefore was choosen as an example for ruined buildings in Valetta. An examination in 1995 showed the following species:

(i) On the top of the walls:

Antirrhinum siculum
Aster squamatus
Beta vulgaris
Bromus diandrus
Bromus rigidus
Chrysanthemum coronarium
Conyza bonariensis
Daucus carota
Diplotaxis tenuifolia
Dittrichia viscosa
Erodium malacoides
Hordeum leporinum
Lamarckia aurea
Lavatera cretica
Parietaria judaica
Polycarpon tetraphyllum
Reichardia picroides
Reseda alba

Scleropoa rigida
Senecio vulgaris
Sisymbrium irio
Sonchus oleraceus
Urospermum picroides

(ii) at the bottom of the walls:

Chrysanthemum coronarium
Hordeum leporinum
Lavatera cretica
Malva parviflora
Paretaria judaica
Reseda alba

3.3. The wall flora of occupied houses in cities

Naturally the walls of inhabited houses are largely free of plants. In the city of Mdina we found the follwing plants:

Reseda alba (8 houses, especially on ledges and sills)
Antirrhinum siculum (6 houses)
Parietaria judaica (4 houses)
Ferula communis (2 houses, only on ledges and sills)
Nicotiana glauca (2 houses)
Diplotaxis tenuifolia (1 house)
Dittrichia viscosa (1 house)
Ficus carica (1 house)
Sonchus oleraceus (1 house)

In the capital Valetta we only got the following results:

Antirrhinum siculum (4 houses)
Parietaria judaica (2 houses)
Hyoscyamus albus (1 house)
Sisymbrium irio (1 house)

Many species are growing at the bottoms of pavements and walls in the urban settlements, esp. in the suburbs:

Antirrhinum majus ssp. majus
Antirrhinum siculum
Aster squamatus
Bromus diandrus
Capparis spinosa
Capsella bursa-pastoris
Chenopodium murale
Chrysanthemum coronarium
Conyza bonariensis
Cmbalaria muralis
Daucus carota
Diplotaxis tenuifolia
Dittrichia viscosa
Erodium malacoides
Euphorbia peplus
Ficus carica
Foeniculum vulgare
Fumaria spec.
Hordeum leporinum
Hyoscyamus albus
Lavatera cretica
Malva parviflora
Malva sylvestris
Oryzopsis miliacea

Oxalis corniculata
Oxalis pes-caprae
Parietaria judaica
Polycarpon tetraphyllum
Polypogon monspeliense
Reseda alba
Scrophularia peregrina
Silene colorata
Sonchus oleraceus
Spergularia cf. rubra
Sonchus oleraceus
Stellaria media
Thelygonum cynocrambe
Urtica membranacea

3.4. Wall flora of retaining walls around the fields

Species of the class Stellarietea predominate in the flora of the dry walls (fig. 12, fig. 13):

Arisarum vulgare
Avena barbata
Borago officinalis
Chrysanthemum coronarium
Convolvulus arvensis
Foeniculum vulgare
Fumaria capreolata
Hordeum leporinum
Oxalis pes-caprae
Papaver dubium
Reseda alba
Sonchus oleraceus
Sonchus tenerrimus

Oxalis pes-caprae (fig. 7), an alien originating to South Africa is dominant in the dry-stone walls surrounding the fields; in springtime its yellow flowers set the tone of the landscape. Because of its large morphological plasticity, this species is able to produce shoots of some 70 cm, before it develops green leaves (BRANDES 1991). Therefore *Oxalis pes-caprae* is able to use the numerous walls as a place for assimilation, without the problems of dry falling joints. Dry-stone walls surrounding the fields are nowadays the most important growing places of *Oxalis pes-caprae* in Malta.
Low stone walls near the coast are characterized by additional species growing wild in the coastal rocks:

Beta vulgaris
Capparis spinosa
Inula crithmoides
Lobularia maritima

Retaining walls along the field-paths in the valleys show some weeds and ruderals amongst *Oxalis pes-caprae*:

Antirrhinum siculum
Arum italicum
Asparagus aphyllus
Aster squamatus
Beta vulgaris
Borago officinalis
Convolvulus arvensis
Foeniculum vulgare
Mercurialis annua
Sonchus oleraceus

Especially on the tops of the walls the following species are growing:

Arundo donax (!)
Avena sterilis
Hypericum triquetrifolium
Reichardia picroides
Silene vulgaris

In the retaining walls in the wieds as well as in the walls of small bridges (fig. 14) are to be found:

Antirrhinum siculum
Aster squamatus
Atriplex prostrata
Borrago officinalis
Capparis spinosa
Cerinthe major
Conyza bonariensis
Diplotaxis tenuifolia
Eucalyptus spec. juv.
Ficus carica
Galactites tomentosa
Lavatera cretica
Olea europaea
Oryzopsis miliacea
Oxalis pes-caprae
Parietaria judaica
Rumex conglomeratus

4. Alien species on the walls

The following alien plants are found on walls:

Aeonium arboreum
Ailanthus altissima
Arundo donax
Cheiranthus cheri
Cymbalaria muralis
Eucalyptus spec.
Nicotiana glauca
Opuntia ficus-indica
Oxalis pes-caprae
Passiflora caerulea
Trachelium caeruleum

Except of *Oxalis pes-capreae* aliens are of low importance. *Oxalis pes-caprae* is especially dominant in retaining walls and stony dry walls in the open field. Due to its phenotypic plasticity the species is able to occupy niches, which till now are not settled by any species (BRANDES 1991).

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